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10/552,773	10/12/2005	Erik Gosuinus Petrus Schuijers	NL 030515	2140

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EXAMINER	
PULLIAS, JESSE SCOTT	
ART UNIT	PAPER NUMBER
2626	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/552,773	SCHUIJERS ET AL.	
	Examiner	Art Unit	
	JESSE S. PULLIAS	2626	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 October 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 October 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. The following title is suggested: “Converting decoded sub-band signal into a stereo signal”.

2. The examiner requests the following portions of the specification be clearly titled.

BACKGROUND OF THE INVENTION.
BRIEF SUMMARY OF THE INVENTION.
BRIEF DESCRIPTION OF THE DRAWINGS.
DETAILED DESCRIPTION OF THE INVENTION.

Information Disclosure Statement

3. The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609.04(a) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

Claim Objections

4. Claim 16 objected to because of the following informalities: “switching” is misspelled. Appropriate correction is required.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claim 8 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 8 recites the limitation "the subband filter bank" in line 1. There is insufficient antecedent basis for this limitation in the claim. For purposes of examination, it will be assumed that this claim was intended to read “A device as claimed in claim 3…”.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1, 2, 6, 7, and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Osakabe (3,992,582).

With respect to claims 1 and 17, Osakabe discloses providing an output audio signal (**Col 3 lines 35-37, output terminal 7**) based on an input audio signal, **(Col 3 lines 3-5, input terminal 1)** the input audio signal comprising a plurality of input sub-band signals (**Abstract lines 3-5,** the input is divided into a plurality of frequency bands**)**, the method comprising:

delaying at least part of the input sub-band signals to obtain a plurality of delayed sub-band signals, **(Col 3 lines 3-20)**

wherein at least one input sub-band signal is delayed more than a further input sub-band signal of higher frequency, **(Col 3 lines 25-33,** components lower than 1KHz are delayed 5 seconds, and frequencies from 1 to 2.5 kHz are delayed 0.5 seconds**)**

deriving the output audio signal from a combination of the input audio signal and the plurality of delayed sub-band signals **(Col 3 lines 33-37,** the combination from adder 3 is added to the input signal in adder 6 to derive the output**).**

With respect to claim 2, Osakabe discloses the output audio signal includes a plurality of output sub-band signals **(Col 3 lines 33-37,** since a plurality of sub-band signals are added to form the output, they are included**).**

With respect to claim 6, Osakabe discloses the plurality of delay units comprises a first delay unit **(Fig 1, D.L. 2C)** for delaying a group of relatively high frequency sub-bands with one sub-band sample, **(Col 3 lines 31-33,** higher than 2.5 kHz is delayed by 0.5 seconds, which is by at least one sample**)** and at least one further delay unit **(Fig 1,**

D.L.2B) for delaying a group of relatively low frequency sub-bands with at least a further sub-band sample **(Col 3 lines 26-29,** lower than 1 kHz is delayed 5 seconds**).**

With respect to claim 7, Osakabe discloses the delay units provide delays which are monotonically increasing from high frequency to low frequency **(Col 2 lines 34-40,** and **Col 3 lines 5-23,** the delay times are 0.5, 2, and 5 seconds**).**

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 3, 5, 8, 9, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Osakabe (3,992,582) in view of Shimoyoshi et al (5,461,378).

With respect to claims 3, 8, and 9, Osakabe does not specifically disclose a sub-band filter bank for synthesizing a time domain output audio signal from the plurality of output sub-band signals.

Shimoyoshi discloses a sub-band filter bank for synthesizing **(Col 18 lines 13-18)** a time domain output audio signal from the plurality of output sub-band signals **(Col 18 lines 17-18)**, and implies the sub-band filter bank is a complex sub-band filter bank

(Col 4 lines 62-63 disclose a QMF used in the encoder. **Col 18 lines 13-14** disclose a band synthesis filter**).**

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention of Osakabe by using QMF sub-band division and synthesis as suggested by Shimoyoshi, in order to take advantage of well known properties for decimation and perfect reconstruction.

With respect to claim 5, Osakabe does not specifically disclose the number of delay units is smaller than the number of input sub-band signals, and wherein the input sub-band signals are subdivided in groups over the plurality of delays units.

Shimoyoshi discloses the number of delay units **(Col 5 lines 66-67,** block floating is performed, which involves delaying, as seen in **Col 6 lines 52-54)** is smaller than the number of input sub-band signals, **(Col 5 lines 8-9, 31-32, and 51-52,** there are many subbands and only 3 delay units**)** and wherein the input subband signals are subdivided in groups over the plurality of delays units **(Col 5 lines 8-9, 31-32, and 51-52,** they are subdivided into three ranges**).**

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention of Osakabe by having the number of delay units smaller than the number of input sub-band signals, and wherein the input sub-band signals are subdivided in groups over the plurality of delays units as shown by Shimoyoshi, in order to reduce the number of steps in a software implementation, as suggested by Shimoyoshi **(Col 7 lines 29-36).**

With respect to claim 18, in addition to the subjects of claim 1, it contains a decoder, which is not specifically mentioned by Osakabe. Shimoyoshi specifically mentions a decoder. **(Col 4 lines 10-12).**

It would have been obvious to one of ordinary skill in the art at the time of the invention to include the decoder taught by Shimoyoshi in the invention taught by Osakabe, in order to be able to accept encoded signals, as suggested by Shimoyoshi **(Col 12 lines 53-57).**

6. Claims 4, 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Osakabe (3,992,582) in view of Wilde et al (5,235,646).

With respect to claim 4, Osakabe does not specifically mention the input audio signal is a mono audio signal and the output audio signal is a stereo audio signal.

Wilde specifically mentions the input is a mono audio signal and the output audio signal is a stereo audio signal (**Col 4 lines 19-21**).

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the inventions of Osakabe and Wilde such that the input audio signal is a mono audio signal and the output audio signal is a stereo audio signal, in order to let the listener perceive a broader sound, as suggested by Wilde (**Col 2 lines 3-6**).

With respect to claim 10, Osakabe does not specifically mention obtaining a correlation parameter indicative of a desired correlation between a first channel and a second channel of the output audio signal and wherein the combining unit is arranged for obtaining the first channel and the second channel by combining the input audio signal and the plurality of delayed sub-band signals in dependence on the correlation parameter.

Wilde discloses obtaining a correlation parameter which is indicative of a desired correlation between a first channel and a second channel of the output audio signal (**Col 5 lines 32-35**, cross-correlation measure of the output signals),
combining the a sub-band and a delayed sub-band (**Col 5 lines 25-31**, the band limited signals are phase shifted, or delayed, and then summed) in dependence on the correlation parameter (**Col 5 lines 31-35**, the cross-correlation measure depends on the phase shifts).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention of Osakabe by obtaining a correlation parameter which is indicative of a desired correlation between a first channel and a second channel of the output audio signal, wherein the processing is arranged to obtain the processed signals by combining the transformed signal and the transformed delayed signal in dependence on the correlation parameter, and wherein the first channel is derived from a first set of processed signals and the second channel from a second set of processed signals, for reasons similar to those of claim 4.

With respect to claim 11, Osakabe and Wilde disclose the first channel and the second channel each comprise a plurality of output sub-band signals **(See Wilde Fig 1, y1(t) and y(2)** comprise a plurality of output sub-band signals, since any wideband signal comprises sub-band signals**).**

While Osakabe discloses a combining unit **(Fig 1 element 3)** and sub-band synthesis **(Fig 1 element 6),** and Wilde discloses a sub-band synthesis filter bank **(**the y(2) channel is synthesized at the output using an adder **Fig 1, element 16).** Since two synthesis filters are required to output stereo sound, the two synthesis filters are inherent.

7. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Osakabe (3,992,582) in view of Liljeryd et al (6,680,972).

With respect to claim 12, Osakabe discloses deriving M sub-bands to generate M filtered sub-band signals on the basis of a time domain core audio signal **(Fig 1, L2 and L3** are two sub-bands**)**

Osakabe does not specifically disclose generating a high-frequency signal component derived from the M filtered sub-band signals, the high-frequency signal component having N-M sub-band signals, where N>M, the N-M sub-band signals including sub-band signals with a higher frequency than any of the sub-bands in the M sub-bands, the M filtered sub-bands and the N-M sub-bands together forming the plurality of input sub-band signals.

Liljeryd discloses generating a high-frequency signal component derived from filtered sub-band signals **(Col 2 lines 8-14,** high frequency reconstruction**)** the high-frequency signal component having N-M sub-band signals, where N>M, **(Col 15 lines 47-51,** the high frequency signal component has QL-L sub-band signals, where QL>L, or Q>1, see **Col 16 lines 10-12,** Q=2**)** the N-M sub-band signals including sub-band signals with a higher frequency than any of the sub-bands in the M sub-bands, **(Col 15 lines 47-51,** all the synthesized sub-bands have a higher frequency than the L lowband channels) the M filtered sub-bands and the N-M sub-bands together forming the plurality of input sub-band signals.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention of Osakabe by taking the above steps taught by Liljeryd in order to implement Spectral Band Replication, which was a well known coding technique for reducing bit-rate while preserving perceptual quality, as suggested by Liljeryd **(Col 1 lines 14-16).**

8. Claims 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Osakabe (3,992,582) in view of Fujita et al (6,430,294), in further view of Valimaki et al. (Principles of Fractional Delay Filters. IEEE International Conference on Acoustics, Speech, and Signal Processing, Istanbul, Turkey, 5-9 June 2000).

With respect to claims 13 and 14, Osakabe discloses a delay unit **(Fig 1 element 2A)** but does not specifically disclose a fractional delay unit and switching unit. Fujita

discloses a delay unit **(Fig 16, Delay Device 20)** and switching unit **(Fig 16, Cross-Fade Mixing Means 23)** but does not specifically mention the delay unit being fractional.

Valimaki specifically mentions a fractional delay unit **(Title).**

It would have been obvious to one of ordinary skill in the art to modify the invention of Osakabe to include a switching unit, as taught by Fujita, in order to weight the output signal, as suggested by Fujita **(Col 4 lines 63-65).** Furthermore, it would have been obvious to modify a delay unit taught by Osakabe or Fujita with a fractional delay unit, as taught by Valimaki, in order to facilitate sampling rate conversion, as suggested by Valimaki **(Page 4, Section 5 lines 2-4)** which would make the invention more flexible by allowable it to convert various sampling rates.

The intended uses of the delay units, fractional delay unit, and switching units recited in the claim do not limit the structure of the claimed device.

With regard to claims 15 and 16, the switching unit above taught by Fujita comprises a detection unit for detecting a signal strength of the input audio signal **(Col 23 lines 63-54,** the cross fade mixing means detects the delay coefficient, which is implicitly correlated with signal strength since in spatial audio a further away source will be quieter and delayed longer, while a closer source will be both louder and have shorter delay**),** wherein the switching means is arranged for switching delays **(Col 25 lines 6-10,** the delay is changed) in the case that the signal strength is above a predetermined threshold, **(Col 24 lines 5-13,** the threshold is 0, and **lines 54-59,** the

output is employed as cross-fade coefficients**).** The input audio signal includes a switching indicator **(Col 24, lines 54-59,** cross fading coefficients, are derived from the input audio signal**)**, and wherein the switching unit is arranged for switching in dependence on the switching indicator **(Col 25 lines 6-10,** the delay is changed, depending on the coefficients**).**

Although Fujita or Osakabe do not specifically disclose fractional delay, it would have been obvious to one of ordinary skill to make the modification for reasons similar to claims 13-14.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

5,974,380 Smyth et al. discloses a muti-channel audio decoder in which a signal is reconstructed from encoded sub-bands

7,006,636 Baumgarte et al. disclose an auditory scene synthesis system that modifies parameters according to coherence within the bands

6,005,946 Varga et al. disclose a method for generating a stereo signal from a mono signal

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jesse Pullias whose telephone number is 571/270-5135. The examiner can normally be reached on M-F 9:00 AM - 4:30 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Hudspeth can be reached on 571/272-7843. The fax phone number for the organization where this application or proceeding is assigned is 571/270-6135.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Jesse S Pullias/
Examiner, Art Unit 2626

/Talivaldis Ivars Smits/
Primary Examiner, Art Unit 2626

3/18/2008